

MONGOLIA  
CENTRAL GEOLOGICAL LABORATORY



# CERTIFICATE OF ANALYSIS

**Certified Reference Material “CGL 303”**

**Mercury Soil-1 (MS-1)**

**Certified value (CV) and expanded uncertainty (U), number of results (n)**

| Element | Unit  | CV    | U     | n  |
|---------|-------|-------|-------|----|
| Hg      | mg/kg | 0.157 | 0.028 | 23 |

**Information values (IV), number of results (n)**

| Element                            | Unit | IV    | n  |
|------------------------------------|------|-------|----|
| Dry mass                           | %    | 99.05 | 21 |
| TC                                 | %    | 1.19  | 3  |
| N                                  | %    | 0.088 | 3  |
| S                                  | %    | 0.021 | 1  |
| SiO <sub>2</sub>                   | %    | 64.39 | 2  |
| TiO <sub>2</sub>                   | %    | 0.65  | 2  |
| Al <sub>2</sub> O <sub>3</sub>     | %    | 13.10 | 2  |
| Fe <sub>2</sub> O <sub>3</sub> tot | %    | 4.68  | 2  |
| MnO                                | %    | 0.097 | 2  |
| MgO                                | %    | 1.68  | 2  |
| Na <sub>2</sub> O                  | %    | 1.84  | 2  |
| CaO                                | %    | 3.39  | 2  |
| K <sub>2</sub> O                   | %    | 2.98  | 2  |

**Classification criteria**

CV - based on a minimum of 10 mean results with a minimum of 2 independent methods

IV - information value, not certified

**Intended uses of this Certified Reference Material (CRM)**

This CRM is intended to be used for instrument calibration, method validation and quality control applications.

**Description of the sample**

Surface soils from the South Gobi region were used as starting material for this CRM. The soils were of mainly mineral type, with only minor content of organic matter. Information values for total Carbon (C), Nitrogen (N), Sulfur (S), and major constituents are included in this certificate. The sampling was conducted in 2010 by the Central Geological Laboratory (CGL), in accordance with relevant sampling procedures.

The substantial composition study was executed in 2010 by the CGL.

The mineral composition of the material has been determined to be:

| Minerals  | Percentage, % m/m |
|-----------|-------------------|
| Quartz    | 48                |
| Calcite   | 25                |
| Feldspar  | 26.9              |
| Hematite  | 0.1               |
| Muscovite | Rare              |
| Sphene    | Rare              |
| Apatite   | Rare              |
| Zircon    | Rare              |

**Sample Preparation**

The starting bulk materials were sieved on site and the fractions < 2 mm were collected for further processing. Sample preparation, homogeneity testing and bottling were performed at the CGL laboratories in 2010-2011. The main preparation steps consisted in air drying, crushing and pulverization. The entire mass of prepared material passed a stainless steel sieve with an opening of 0.075 mm of an automated ultrasonic sieving machine. The particle size of this material is therefore regarded as 100% < 0.075 mm. The target concentration for the material was achieved by blending of different bulk materials by a calculated ratio after determination of Mercury concentrations. The mixed blending materials were homogenized by a high performance intensive mixer type EIRICH R 09 W.

After passing the homogeneity test criteria, finally 30 g and 50 g reference material units were bottled by rotary splitting.

**Certification**

An interlaboratory approach with 23 participating laboratories was selected to obtain a reliable base of data for assignment of the certified values. A nested design was chosen for maximum information output. Only laboratories prequalified by a proficiency test, were invited. Analytical results were based on various digestion- and determination methods. The traceability was established to the existing CRM BCR-320R (IRMM). Production and evaluation procedures were assessed by the Technical Council (TC) of CGL, for compliance with the valid ISO-Guides.

**Instructions for use, storage and transportation**

The certified value (CV) of the Mercury (Hg) concentration is based on analyses of non dried sample and corrected to the dry sample weight. The determination of the sample dry weight was executed parallel for a separate sample portion, as drying of sample possibly induces losses of mercury.

The recommended minimum sample test portion mass is 100 mg. If a test method requires using test portion less than 100 mg, it is recommended that an excess of the CRM (> 100 mg) is further pulverized in an agate mortar, before weighing out the needed mass.

Material that had once been removed from the original sample bottle should not be returned to it, as that might cause contamination of the remaining sample.

The CRM should be stored protected from direct sunlight, at room temperature and tightly sealed to protect it from absorption of atmospheric moisture and laboratory chemicals.

The material can be transported by any kind of transport means.

**Validity of the Certificate**

This material is considered to be stable. Therefore, this certificate of analysis shall remain valid through 2031, unless users are otherwise notified.

**Availability of Material**

This “CRM from Mongolia” is available as “CGL 303” from your local LGC Standards office.

**Customer Feedback**

Customers, using this CRM are kindly requested to register at the Central Geological Laboratory. This opens the opportunity to notify the user community on any new development with regard to this CRM. Customer feedback with respect to certified and information values is highly appreciated.

## Participating Laboratories

- 1 Central Geological Laboratory, Ulaanbaatar, Mongolia
- 2 BGR - Federal Institute for Geosciences and Natural Resources, Hannover, Germany
- 3 VSEGEI All Russia Geological Research Institute, Central Laboratory, St.Petersburg, Russia
- 4 Landeslabor Berlin-Brandenburg (D) Fachbereich U2, Kleinmachnow, Germany
- 5 Landeslabor Schleswig-Holstein, Neumuenster, Germany
- 6 University of Duisburg-Essen, Institute of Environmental Analytical Chemistry, Essen, Germany
- 7 Bundesforschungs und Ausbildungszentrum fuer Wald Naturgefahren und Landschaft, Institut fuer Waldoekologie / Boden, Wien, Austria
- 8 Lfu Bayern, Bayrisches Landesamt Fuer Umwelt, Augsburg, Germany
- 9 LANUV NRW, Herten, Germany
- 10 BAFG, BA f.Gewaesserkunde, Ref. Gewaesserchemie, Koblenz, Germany
- 11 SMUL Sachsen, Staatliche Betriebsgesellschaft fuer Umwelt und Landwirtsch. Geschaefsbereich 5 I Labore Umwelt, Radebeul, Germany
- 12 RUETGERS aromatic Chemical GmbH, Castrop-Rauxel, Germany
- 13 Hygiene-Institut Ruhrgebiet, Gelsenkirchen, Germany
- 14 Laboratorio Nacional de Energia e Geologia, I.P. Laboratorio do Porto, S.Mamede de Infesta – MTS, Portugal
- 15 BIOLAB Umweltanalysen GmbH, Braunschweig, Germany
- 16 Wessling Laboratorien GmbH Labor München, Neuried, Germany
- 17 LUFA Nord-West, Hameln, Germany
- 18 LANUV, FB63, Bonn, Germany
- 19 LBEG, Landesamt fuer Bergbau, Energie und Geologie L3.7/B2.3, Hannover, Germany

## Test methods applied for the determination of Mercury and number of results per method (n) :

- DC-AAS - Direct combustion-atomic absorption spectroscopy (10)
- CV-AAS - Cold vapor -atomic absorption spectroscopy (9)
- CV-AFS - Cold vapor -atomic fluorescence spectroscopy (3)
- ICP-OES - Inductively coupled optical emission spectrometry (1)

## Legal notice

This reference material was approved as a certified reference material by the order No. 148 of Technical Council of Central Geological Laboratory on 24<sup>th</sup> August 2011.

**Signed by B.BATJARGAL /DIRECTOR of Central Geological Laboratory/**